Stress Calculation of Weldment Extension-2

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March 29, 2016

Stress is calculate for weldment extension-2 of cavity string (Figure 1). The inside is vacuum and the outside is applied with atmospheric pressure of 0.101235 MPa. The two end surfaces of flange is fixed (Figure 2).

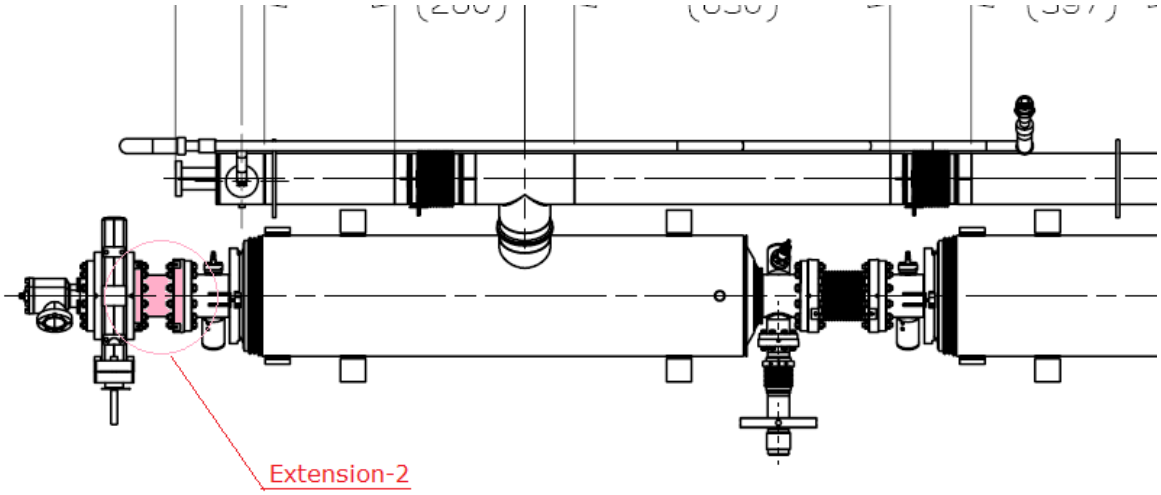

Figure 1. Extesion-2 of cavity string

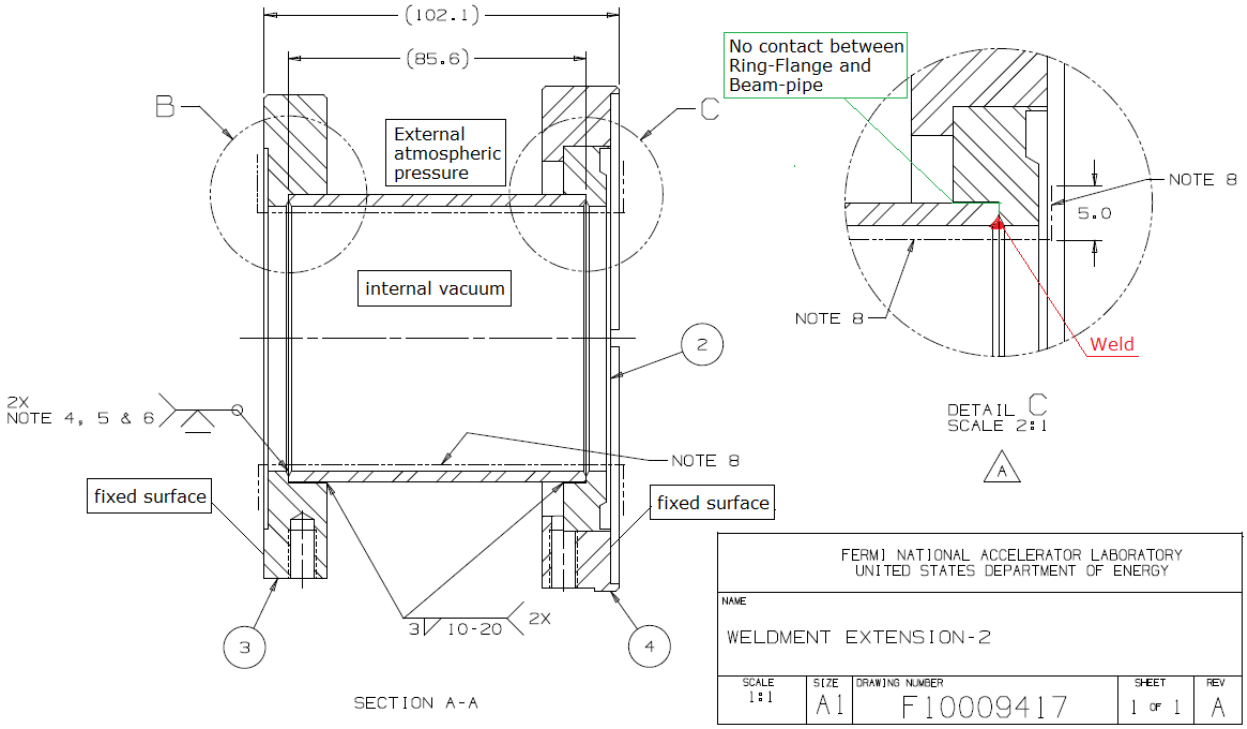

Figure 2. Weld and Load Conditions

Figure 3 shows the pressure for internal vacuum. The maximum stress is only 1.78 MPa (258 psi).The displacement is in Figure 4. The maximum displacement is 0.27 μm.

The minimum yield stress for 316L stainless steel is 170 MPa. The maximum stress in weld is about 1% of the yield stress.

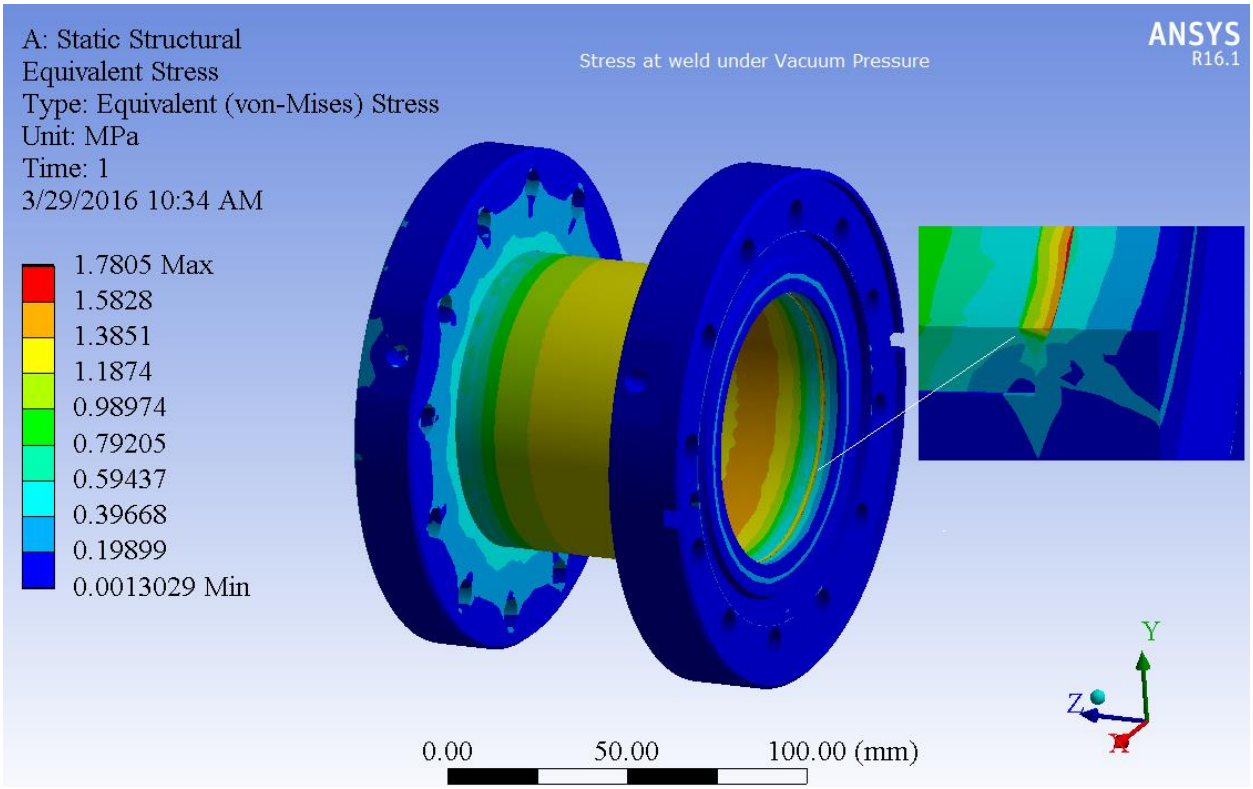

Figure 3. Stress for internal vacuum

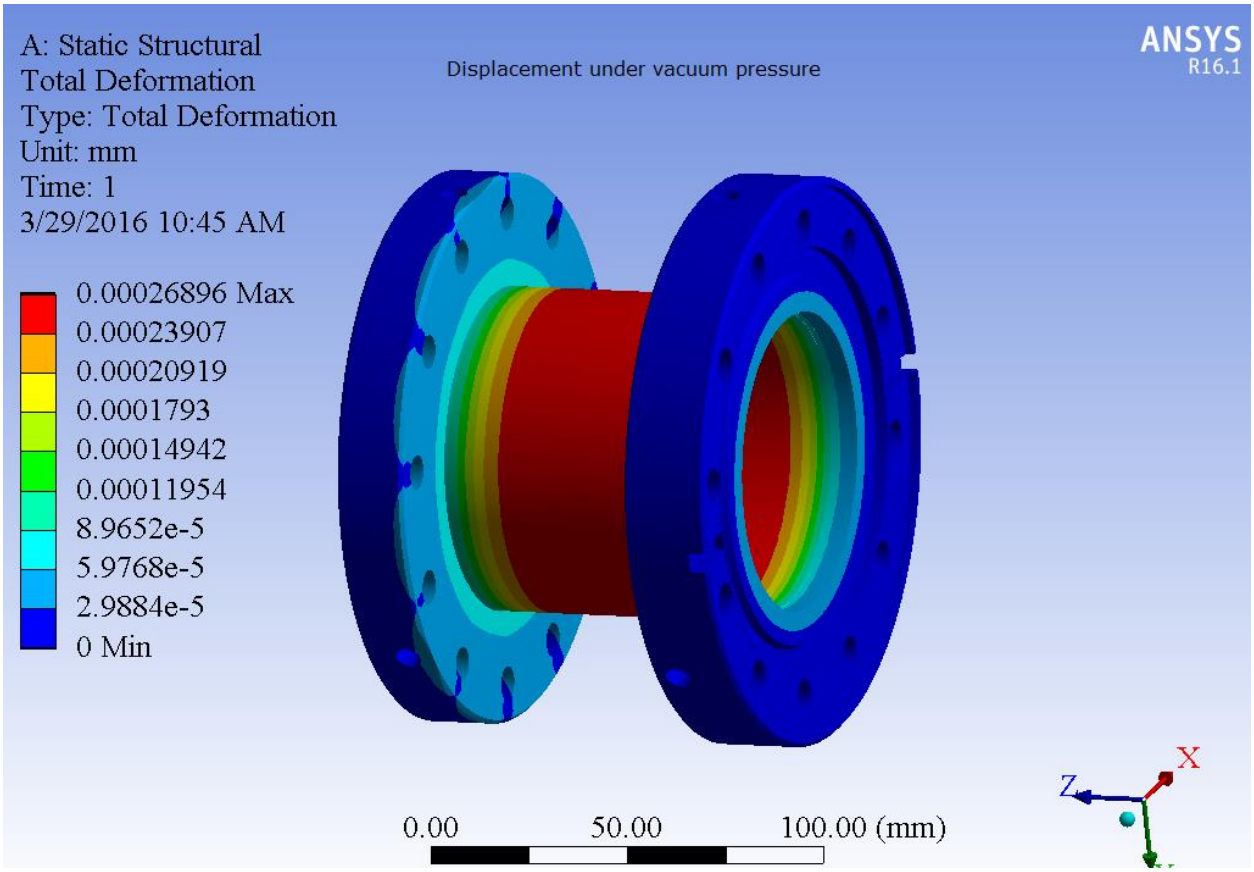

Figure 4. Displacement for internal vacuum

If we reverse the load (external vacuum, internal atmospheric pressure), the results are not too much different (Figures 5 and 6).

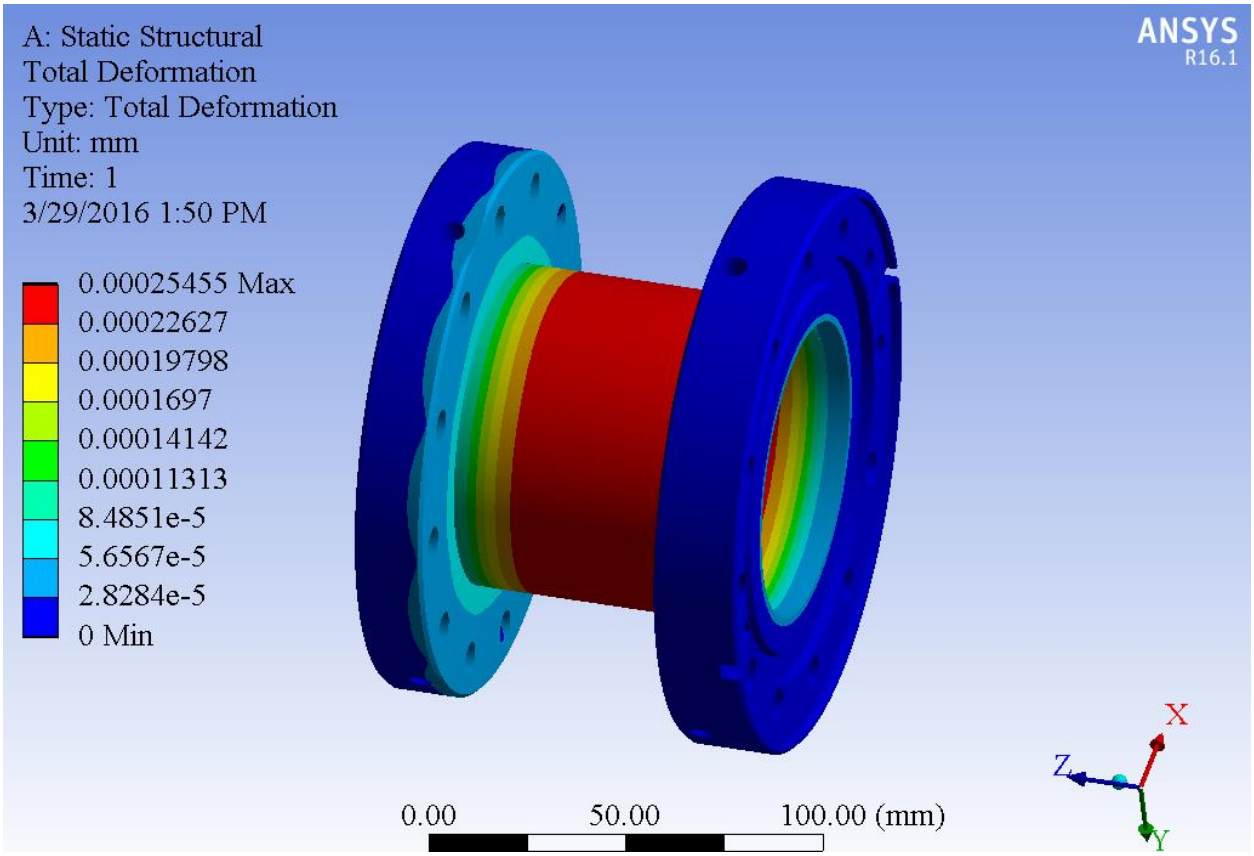

Figure 5. Displacement for external vacuum

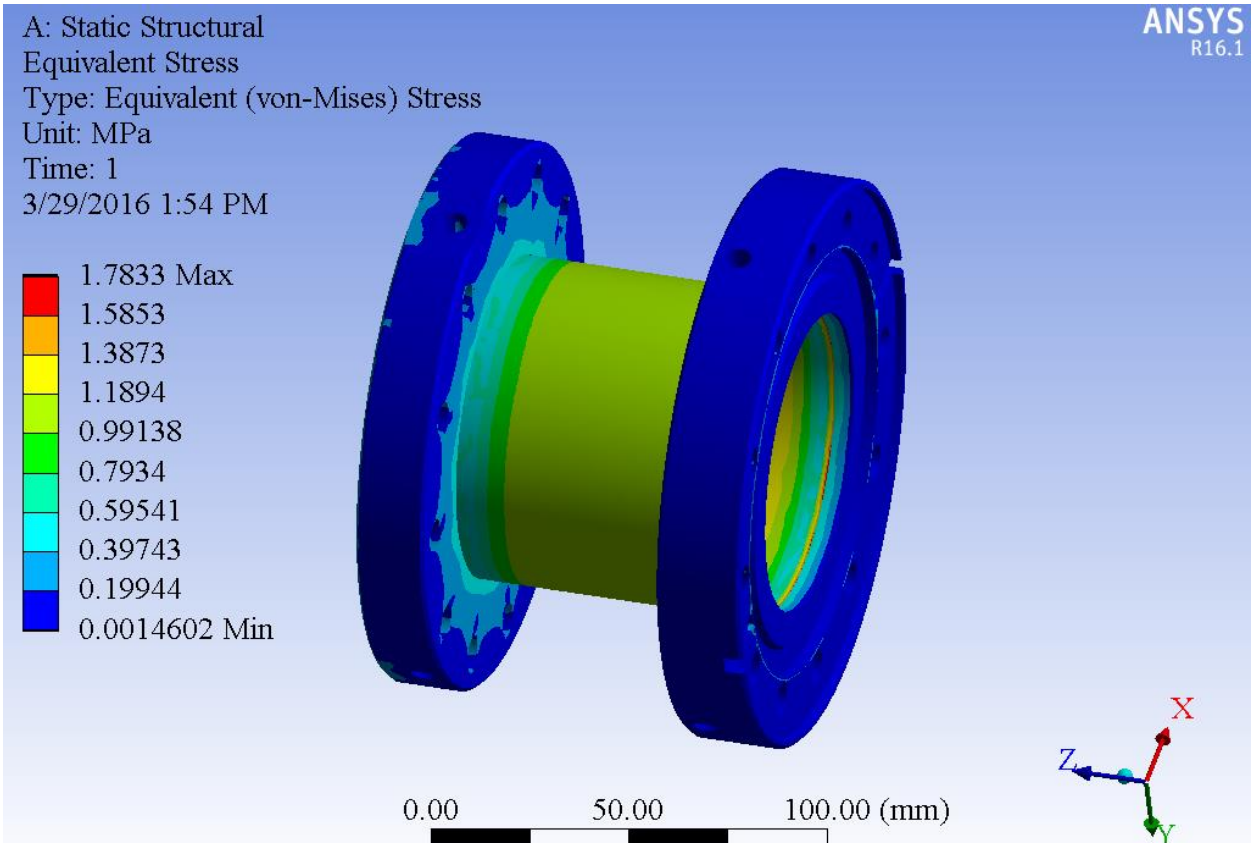

Figure 6. Stress for external Vacuum

Consider the seismic and transportation load. There is a valve of 50 lbm, which is supported vertically, under seismic or transportation acceleration, there is a horizontal load along the axis of the beam line. Since the maximum seismic acceleration is 0.8 g, and the transportation acceleration considered is 1.5 g. We take the 1.5*50 lb = 75 lb = 333.6 N. This load is applied to one flange while the other flange is fixed.

Figures 7 and 8 shows the stress and displacement of the model. The maximum stress is 4.2 MPa, and the maximum displacement is 0.81 μm.

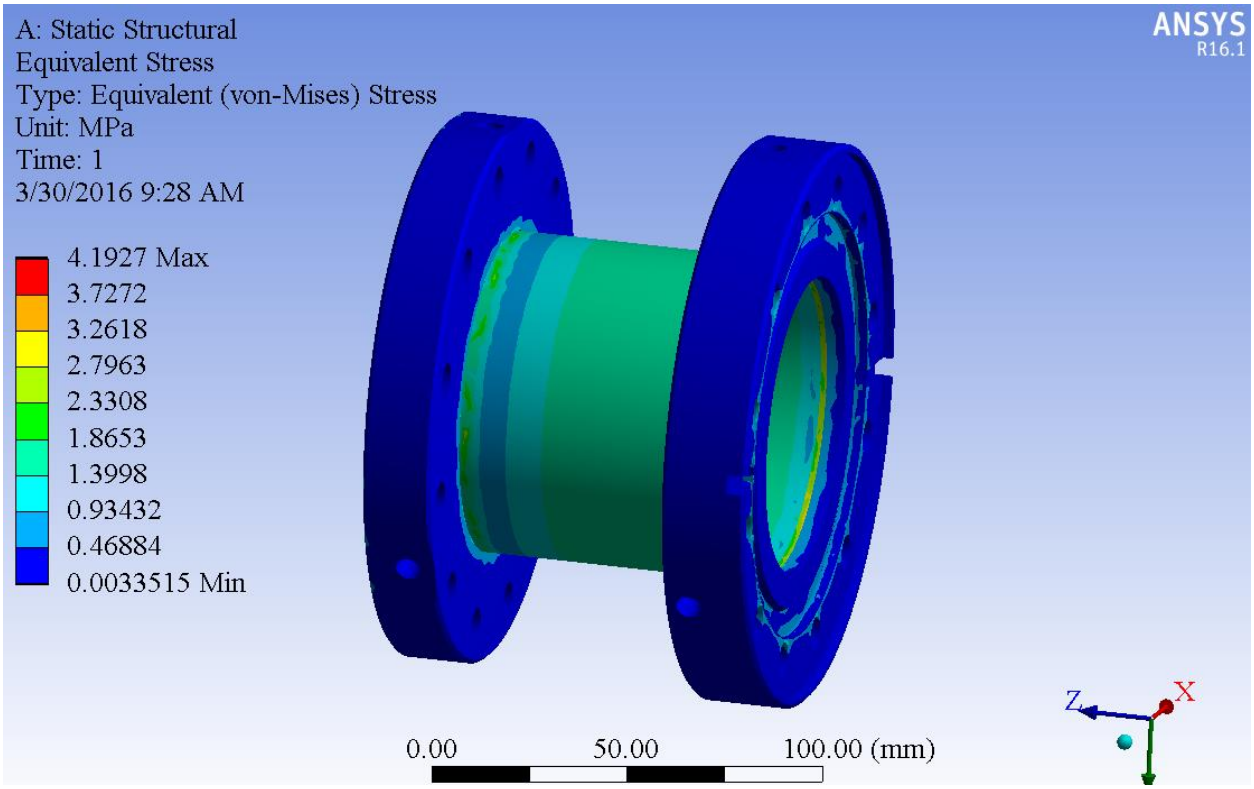

Figure 7. Stress of model under internal vacuum and 333.6 N axial load

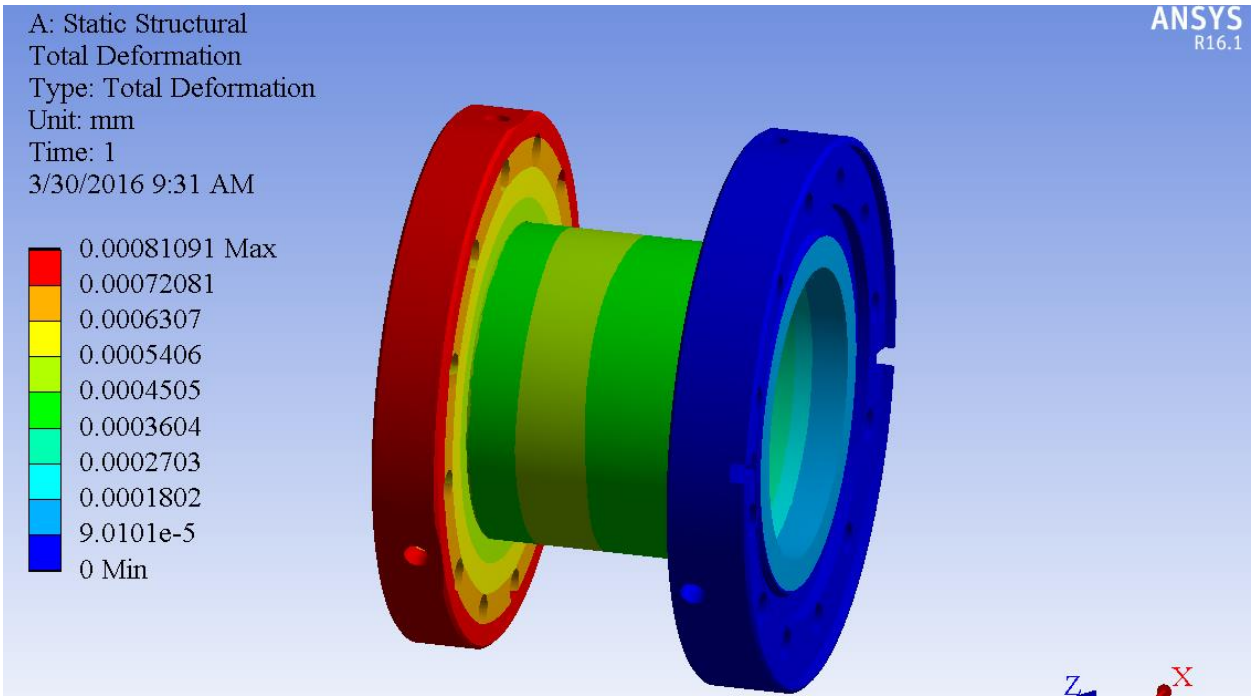

Figure 8. Displacement under internal vacuum and 333.6 N axial load.